

# LESSON 26 Solving Problems with a System of Linear Equations

## Review It!

When you solve problems with a system of linear equations, remember this:

**system of linear equations** two or more linear equations

Tony is thinking of two numbers. If he multiplies the first by 3 and the second by 2 and then adds the products together, he gets 7. If he multiplies the first by 2 and then subtracts the second, he gets 0. What are Tony's numbers?

**Step 1** Write two linear equations.

Let  $x$  = first number and  $y$  = second number.

The first equation is  $3x + 2y = 7$ . The second equation is  $2x - y = 0$ .

**Step 2** Find an equivalent equation for  $2x - y = 0$  that makes the  $y$ -term equal 0 when you add the two equations.

$$\begin{array}{l} 2(2x - y) = 2(0) \\ 4x - 2y = 0 \end{array}$$

**THINK** Multiplying both sides of an equation by the same number forms an equivalent equation.

**Step 3** Add the two equations and solve for  $x$ .

$$\begin{array}{r} 3x + 2y = 7 \\ + 4x - 2y = 0 \\ \hline 7x - 0 = 7 \\ x = \underline{\hspace{2cm}} \end{array}$$

**Step 4** Solve for  $y$ , using  $x = 1$ .

$$\begin{array}{l} 2x - y = 0 \\ 2(1) - y = 0 \\ 2 - y = 0 \\ 2 - y + y = 0 + y \\ 2 = y \end{array}$$

So, Tony's first number is \_\_\_\_\_ and his second number is \_\_\_\_\_.

## Try It!

Solve each system of linear equations.

1.  $2x + 5y = 7$  and  $3x - y = 2$

$x = \underline{\hspace{2cm}}; y = \underline{\hspace{2cm}}$

2.  $4x + y = 10$  and  $2x - y = 2$

$x = \underline{\hspace{2cm}}; y = \underline{\hspace{2cm}}$

3.  $3x - 2y = 5$  and  $x + y = 5$

$x = \underline{\hspace{2cm}}; y = \underline{\hspace{2cm}}$

4.  $2x + y = 11$  and  $x - 2y = 3$

$x = \underline{\hspace{2cm}}; y = \underline{\hspace{2cm}}$

Translate the situation into a system of linear equations. Then solve.

5. The eighth-grade class had a bake sale. They sold 55 bars and cookies altogether and made \$115. Each bar cost \$3 and each cookie cost \$1. How many bars and how many cookies did they sell?

\_\_\_\_\_

6. Dan's collection of quarters and dimes totals \$6. There are 30 coins in all. How many quarters and how many dimes are in his collection?

\_\_\_\_\_

7. The sum of Kim and Tony's ages is 42. The difference in their ages is 4 years. What are Kim's and Tony's ages?

\_\_\_\_\_



1. Multiply  $3x - y = 2$  by what? 2, or 5?

2. What disappears if you add the equations? the  $x$ -term, or the  $y$ -term?

5. What equation relates the bars and the cookies?  
 $3b + c = 115$ ,  
 $b + c = 55$ , or  
both equations?

Algebra

**On Your Own!**

Circle the best answer for each question.

- The local theater performed a comedy. For Friday's performance, they sold a total of 318 adult and child tickets for \$3,550. An adult ticket costs \$12 and a child's ticket costs \$5. How many adult tickets and how many child tickets did they sell?
  - 38 adult tickets and 280 child tickets
  - 58 adult tickets and 260 child tickets
  - 280 adult tickets and 38 child tickets
  - 300 adult tickets and 18 child tickets
- Paul and Rufus buy tomatoes and peaches at a vegetable stand. Paul buys 5 pounds of tomatoes and 3 pounds of peaches for \$21. Rufus buys 4 pounds of tomatoes and 5 pounds of peaches for \$22. What is the cost of 1 pound of tomatoes and 1 pound of peaches?
  - tomatoes: \$1; peaches: \$5
  - tomatoes: \$4; peaches: \$1.20
  - tomatoes: \$2; peaches: \$3
  - tomatoes: \$3; peaches: \$2
- The sum of two numbers is 48. The difference of the two numbers is 4. Find the numbers.
  - 20 and 28
  - 22 and 26
  - 24 and 24
  - 20 and 24
- Angela and Kim buy pictures. All the landscapes cost the same amount and all the animal pictures cost the same amount. Angela buys 4 landscapes and 5 animal pictures for \$171. Kim buys 2 landscapes and 3 animal pictures for \$93. What is the cost of each landscape and of each animal picture?
  - landscape: \$24; animal: \$15
  - landscape: \$15; animal: \$24
  - landscape: \$25; animal: \$14.20
  - landscape: \$14; animal: \$25
- The sum of Joan's age and her daughter's age is 46. Joan is 2 less than 3 times her daughter's age. How old are Joan and her daughter?
  - Joan: 36; daughter: 10
  - Joan: 35; daughter: 11
  - Joan: 34; daughter: 12
  - Joan: 32; daughter: 14

- Bob bought 38 apples and pineapples. He bought 8 more pineapples than he did apples.

**Part A** Write a system of equations that can be used to solve the problem.

**Part B** How many apples and how many pineapples did Bob buy?

**Math Words**

Fill in the blanks.

- Graphing, substitution, and adding equations are ways to solve a system of \_\_\_\_\_.
- If you have two or more linear equations, then you have a \_\_\_\_\_ of \_\_\_\_\_.